WHAT IS CLAIMED IS:

1. A connecting rod comprising:

a connecting beam section serving as a main body of the connecting rod;

a big end located at a first end side of the connecting beam section;

a small end located at a second end side of the connecting beam section, the second end side being axially opposite to the first end side;

a first joining section located between the connecting beam section and the big end to connect the connecting beam section and the big end; and

a second joining section located between the connecting beam section and the small end to connect the connecting beam section and the small end;

wherein each of the first and second joining sections gradually and continuously decreases in cross sectional area toward the connecting beam section and has a strength distribution in which a strength increases with a decrease in the cross sectional area.

2. A connecting rod as claimed in Claim 1, wherein the strength distribution is based on a proportion (%) of martensite.

3. A connecting rod as claimed in Claim 2, wherein the proportion of martensite (%) changes based on a change of the cross sectional area of each of the first and second joining sections in a manner to satisfy a relationship represented by the following formula:

$$D/D_{min} \geq 1/((1-\alpha) \times Ms/100 + \alpha)$$

where D_{min} is the minimum value of the cross sectional area of each of the first and second joining sections; and α is a value obtained by dividing a buckling stress without hardening by a buckling stress with hardening.

4. A connecting rod as claimed in Claim 2, wherein the strength distribution is formed based on a distribution in at least one of a hardening temperature and a tempering time for each of the first and second joining sections.

5. A connecting rod as claimed in Claim 1, wherein the strength distribution is formed based on a strain introduced into each of the first and second joining sections by a cold forging.

6. A connecting rod as claimed in Claim 5, wherein the strain gradually and continuously changes with a change in the cross sectional area of each of the first and second joining sections.

7. A connecting rod as claimed in Claim 5, wherein the strain is adjusted in accordance with a dispersion in thickness of a roughly made connecting rod as a material of the connecting rod.

8. A connecting rod as claimed in Claim 5, wherein each of the first and second joining sections is subjected to an aging after the cold forging.

9. A method of producing a connecting rod including a connecting beam section serving as a main body

of the connecting rod;

a big end located at a first end side of the connecting beam section;

a small end located at a second end side of the connecting beam section, the second end side being axially opposite to the first end side;

a first joining section located between the connecting beam section and the big end to connect the connecting beam section and the big end; and

a second joining section located between the connecting beam section and the small end to connect the connecting beam section and the small end,

the producing method comprising:

gradually and continuously decreasing each of the first and second joining sections in cross sectional area toward the connecting beam section; and

providing to each of the first and second joining sections a strength distribution in which a strength increases with a decrease in the cross sectional area.

10. A producing method as claimed in Claim 9, wherein the strength distribution is based on a proportion (%) of martensite.

11. A producing method as claimed in Claim 10, wherein the proportion of martensite (%) changes based on a change of the cross sectional area of each of the first and second joining sections in a manner to satisfy a relationship represented by the following formula:

$$D/D_{min} \geq 1/((1-\alpha) \times Ms/100 + \alpha)$$

where D_{min} is the minimum value of the cross sectional area of each of the first and second joining sections; and α is a value obtained by dividing a buckling stress without hardening by a buckling stress with hardening.

12. A producing method as claimed in Claim 10, wherein the strength distribution is formed based on a distribution in at least one of a temperature of a hardening and a time of a tempering for each of the first and second joining sections.

13. A producing method as claimed in Claim 12, wherein the hardening is a high-frequency hardening using an induction heating coil, the hardening being carried out by disposing the induction heating coil along each of the first and second joining sections and by setting a distance between the induction heating coil and each of the first and second joining sections in a manner to form the distribution in the hardening temperature.

14. A producing method as claimed in Claim 9, wherein the strength distribution is formed based on a strain introduced into each of the first and second joining sections by a cold forging.

15. A method as claimed in Claim 14, wherein the strain gradually and continuously changes with a change in the cross sectional area of each of the first and second joining sections.

16. A producing method as claimed in Claim 14,

wherein the strain is based on squashing a rib portion of each of the first and second joining sections.

17. A producing method as claimed in Claim 14, wherein the strain is adjusted in accordance with a dispersion in thickness of a roughly made connecting rod as a material of the connecting rod.

18. A producing method as claimed in Claim 14, wherein each of the first and second joining sections is subjected to an aging after the cold forging.

19. A high-strength connecting rod comprising:

a connecting beam section serving as a main body of the connecting rod, the connecting beam section having a portion which is the smallest in cross sectional area throughout the connecting rod;

a big end located at a first end side of the connecting beam section;

a small end located at a second end side of the connecting beam section, the second end side being axially opposite to the first end side;

a first joining section located between the connecting beam section and the big end to connect the connecting beam section and the big end; and

a second joining section located between the connecting beam section and the small end to connect the connecting beam section and the small end;

wherein each of the first and second joining sections gradually and continuously decreases in cross sectional area toward the connecting beam section;

wherein a portion which is the lowest in fatigue strength exists in at least one of the big and small ends, and a portion which varies in fatigue strength exists in each of the first and second joining sections and in the connecting beam sections;

wherein a product of the cross sectional area and the fatigue strength at a cross section of each of the joining and connecting beam sections is equal to or greater than a product of the cross sectional area and the fatigue strength in the smallest cross sectional area portion in the connecting beam section.

20. A high-strength connecting rod comprising:

a connecting beam section serving as a main body of the connecting rod, the connecting beam section having a portion which is the smallest in cross sectional area throughout the connecting rod;

a big end located at a first end side of the connecting beam section;

a small end located at a second end side of the connecting beam section, the second end side being axially opposite to the first end side;

a first joining section located between the connecting beam section and the big end to connect the connecting beam section and the big end; and

a second joining section located between the connecting beam section and the small end to connect the connecting beam section and the small end;

wherein each of the first and second joining sections gradually and continuously decreases in cross sectional area toward the connecting beam section;

wherein a cross section of each of the

connecting beam section and each of the first and second joining sections includes at least one of martensitic structure and ferritic-pearlitic structure and satisfies the following expression:

$$S/D \geq 1/\{(1-\beta)Ms/100+\beta\} \ldots \text{Eq.}(1)$$

where S is a cross sectional area of any portion of each of the connecting beam section and each of the first and second joining sections; D is a cross sectional area of the smallest cross sectional area portion of the connecting beam section; β is a fatigue strength of an unhardened structure / a fatigue structure of a tempered martensitic structure; Ms is a proportion of area of the tempered martensitic structure in the portion whose sectional area is S;

wherein a whole cross section of the smallest cross sectional area portion is formed of the tempered martensitic structure.

21. A high-strength connecting rod as claimed in Claim 19, wherein the high strength connecting rod is formed of a steel including, on mass basis, 0.20 to 0.43% of C, 0.05 to 2.0% of Si, 0.30 to 1.40% of Mn, less than 0.07% of P, 2.5% or less of Cr, 0.05% or less of Al and 0.005 to 0.03% of N, and at least one selected from the group consisting of 0.03 to 0.5% of V, 0.005 to 0.5% of Nb and 0.005 to 0.5% of Ti, the balance being Fe and impurities.

22. A high-strength connecting rod as claimed in Claim 19, wherein the high-strength connecting rod is formed of a steel including, on mass basis, 0.20 to 0.43% of C, 0.05 to 2.0% of Si, 0.30 to 1.40% of Mn,

0.07 to 0.15% of P, 2.5% or less of Cr, 0.05% or less of Al, 0.005 to 0.03% of N, and at least one selected from the group consisting of 0.03 to 0.5% of V, 0.005 to 0.5% of Nb and 0.005 to 0.5% of Ti, the balance being Fe and impurities.

23. A high-strength connecting rod as claimed in Claim 21, wherein the steel further includes, on mass basis, at least one selected from the group consisting of 2.0% or less of Ni, 1.0% or less of Mo, and 0.0010 to 0.0030% of B.

24. A high-strength connecting rod as claimed in Claim 21, wherein the steel further includes, on mass basis, at least one selected from the group consisting of 0.2% or less of S, 0.3% or less of Pb, 0.1% or less of Ca, and 0.3% or less of Bi.

25. A high-strength connecting rod as claimed in Claim 19, wherein the high-strength connecting rod has been subjected to shot peening.

26. A method of producing the high-strength connecting rod of Claim 19, the producing method comprising:

forming a material steel into a shape of the connecting rod;

hardening the material steel having the connecting rod shape by using induction current; and

tempering the hardened material steel at a temperature ranging from 200 to 650 °C.

27. A producing method as claimed in Claim 26,

wherein the tempering is carried out at a temperature ranging from 350 to 550 °C.

28. A producing method as claimed in Claim 26, wherein the tempering is carried out by using induction current.